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## P R E F A C E.

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THE following Syllabus has been drawn up with the view of assisting the Students in the Class of Medical Logic in the University of Aberdeen, in following the Subjects embraced in the Course ; in which the Lecturer has endeavoured, with *Œsterlin* and others, to extend the established principles of Logic to the particular questions and objects of Medical Science.

ABERDEEN, *October*, 1860.

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# SYLLABUS OF LECTURES.

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## LECTURE I. *Nov 5<sup>th</sup>/*

DEFICIENCIES OBSERVABLE IN THE MEDICAL SCIENCES,—  
*Partly traceable to the circumstances of their origin, and the earlier stages through which they have passed.*—Close connection of Medicine, at successive periods, with the ancient superstitions, the crude “philosophies” of the day, and the first rude forms of the Natural and Physical Sciences, but partially emancipated from their alliance with and dependance on Metaphysics. *In part to the subject-matters of the Sciences themselves.* The leading aim of medicine difficultly grasped at by us. Abstract character of all our notions of “health” and “disease.” Obscurity of the connection betwixt means and ends in medicine. “The principle of life” still a purely speculative one,—*In part, also, to the place which the Medical are found to occupy amongst the other Sciences.* The extent of the field over which the medical philosopher has to range, and the diversified character and abstruse nature of many of the enquiries with which he has to grapple. The intermediate place of Biology betwixt the abstract and the concrete Sciences, favourable alike to the extremes of “Dogmatism” on the one side, and “Empericism” on the other, and permitting of its being viewed from either its “Psychical” or its “Somatic side.” Problems hence originating in the Medical Sciences, and consequent special need in these of those correct modes of generalising facts and estimating evidence, successfully adopted in other departments of study.

REMEDY FOR THE PRESENT STATE OF MATTERS IN MEDICAL SCIENCE, AND EXTENT TO WHICH ITS ADOPTION IS CALLED FOR. Mere verbal Logic, equally with "pure" or "formal" or "abstract" Logic unfitted to supply us with rules for our special guidance. "Pure," and "mixed" or "applied" Logic, mutually complementary. The successful application of Logical principles to various sciences exemplified. These examples, proposed for our imitation in Medicine. Arguments in favour of such a course of mixed or applied Logic. Reasonable expectations of unmixed gain from this quarter. The legitimate defence of Scientific Medicine not to be safely rested on mere prescription. Limits to the application of Logical principles to Medical Science. Logic not properly an Organon or instrument of Science, nor fitted to supersede the ordinary methods for their successful pursuit. What it cannot, and what it can do, in coming to our aid. Objections urged against any close alliance betwixt Logic and the other Sciences, met and answered.

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## LECTURE II.

Nov. 6<sup>th</sup>/67

THE true scope and tendency of Medical Science, as these are to be gathered either from a survey of its historical development, or of its present condition. The historical element in this enquiry too much neglected of late. A well executed history of our Science, to what extent still a desideratum ; and what good end it might be reasonably expected to fulfil. The errors of our predecessors a useful study. Causes of the admitted failures of the earlier Empericists and Dogmatists.

Order of the Sciences.—What is meant by order in the Sciences. The natural order of these excludes such distinctions amongst them as speculative and practical, rational and sensible ; and assumes as its basis the subject-matters of each. Scheme of the Sciences built upon a Natural basis. Utility of such a scheme, and the lessons to be acquired from its careful consideration. Consequences of the neglect of this subject on the part of the Medical Profession. Prevalence amongst us of materialistic views. Such views, unduly restrictive of the legitimate field of Medicine, and tending to lower it from its rightful place amongst the other Sciences ; while they are seen to be at variance with sound Logical

principles, contradictory of the lessons of an enlarged experience, inconsistent with the sobriety of true philosophy, and a manifest breach of one of its fundamental laws. The true place of Medicine amongst the other Sciences a central one. Extent of the field thus opened up to us ; and the complexity of the problems with which Medicine has to deal, when regarded from this point of view. Such considerations the best safeguard against the extremes of Credulity and Scepticism. The character of the evidence in support of the facts and conclusions in Medicine substantially the same as that of the more favoured of the Sciences.

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### LECTURE III.

*Method of the Sciences.*—The Method different from the Order of the Sciences. Admitted complexity of phenomena, alike in the worlds of matter and of mind. Matter, as it presents itself to the Chemist, and the modes in which he has to deal with it. Synthesis the necessary complement to his Analyses. Induction and Deduction in Science generally, identical with Analysis and Synthesis respectively, in Chemistry. Frequent loose employment of the terms "Induction" and "Deduction," and the mistakes hence originating. Historical blunders traceable to this source ; and some of the obvious consequences of these. Injurious effects of over or underrating the relative importance of either of these processes : and of overlooking their mutually complementary characters. Mistaken view of Induction as the all in all of Science. Equal errors of relying on Induction apart, or on Deduction apart, where the two admit of being combined. Sense in which Deduction admits of being considered as the higher, and induction as the lower method. Circumstances in which the preference may be rightly assigned to the one or the other of these methods. Induction chiefly available in the earlier periods of most of the Sciences : Exceptions to this : Medicine, in this respect, approaching more to the ordinary, than to the exceptional Sciences ;—a position less discouraging than might at first sight appear. Elementary truths the goal of our Inductions, and the starting points in our Deductions ; a fact readily admitted in Physics though

sometimes denied in Psychology. Intimate, though indirect bearing of Ontology on the other Sciences. Legitimate sphere of the Philosophical method, embracing, as it does, the truths both of observation and of reflection, whether historical or rational ; the former yielding the materials, the latter building up the superstructure of Science. General results reached by the employment of the two-fold form of the Philosophical method. "Emperical" and "Scientific Cognitions," respectively, defined. "Empericism," what? The field of knowledge embraced by it, and the limits beyond which it cannot pass. The desire natural to us to overstep its legitimate bounds, to ascertain something more than the historical order of events, and to enquire into their causes. Distinct and separate spheres of Emperical and Scientific knowledge, each fitted to occupy its own independent position, and capable of aiding the other. Amount of Empericism in every Science. Empericism, the basis of much of our Scientific knowledge, and the proper test of its value ; though not, as some contend, its sole foundation. The necessity for the close union of Scientific principles and practical results, in Medicine, enforced.

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## LECTURE IV.

PREVIOUS illustration of the method of the Sciences : to what extent imperfect. Technical meaning of the term "element." Wider sense of the term, inclusive of all the constituents to be taken into account in our Philosophical method, or methods. "First truths" in mental Science. Axioms and postulates in Mathematics. Forces in Chemistry and Physics generally. "The vital principle, or force" in Biology. Erroneous views regarding this principle. The Psychial element not to be safely overlooked or underrated in any department of Medicine ; Modern tendencies in this direction ; Temptations to deny or disregard it. Comparative facilities for approaching the problems of Medicine from their Somatic side ; and temptations to the practical neglect of their Psychical elements : Illustrated in the cases of certain of the so-called nervous and mental maladies : Dissatisfaction hence attaching to the results reached by us in some even of the lower, as in most of the higher departments of our Science.

*The Inductive or Analytic method generally.*—Different senses in which the term Induction has been employed. Readiest way of avoiding the ambiguities thus occasioned. Induction universally practised, either consciously or unconsciously. Inherent defects of unconscious Inductions. Scientific Inductions alone complete and trustworthy. The admission that valuable results have been arrived at in ignorance or in apparent contempt of Logical rules, no argument for their being dispensed with in the general case. The establishment or advance of Science not to be safely left to the random efforts of untutored genius. The apparently intuitive feature of discoveries, said to have been reached in this way, found to disappear on a close examination. Illustrations from the Biographies of eminent discoverers.

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## LECTURE VI

GENERAL recognition of the rightful place of Induction in the conduct of the Sciences. Special fallacies for its ready employment in the concrete, and obstacles to its application in the abstract Sciences: Explanatory of the position of Medicine amongst the Inductive Sciences, and of the tendencies towards premature Deductions and incomplete Inductions so frequently manifested by medical writers. Available and valuable Inductions, how arrived at. Facts to be industriously accumulated: The facts thus acquired to be viewed in their mutual relations, or compared with each other; and to be systematically re-combined or generalised. Respective spheres of Observation, of Comparison and its subsidiary operations, and of Generalisation and the operations which it includes; processes constituting so many distinct and successive steps towards the accuracy and completeness of the desired results, and demanding the co-operation of minds differently endowed. Inherent instability of any System or Science reared on a narrower foundation than this; as illustrated by the histories—Of the Systems which, in Medicine, preceded and followed the final overthrow of the ancient Philosophy: Of certain Pseudo Sciences of modern origin; and of a Science of our own day. Application of the above test towards the ready discrimination betwixt true and false

or incomplete Sciences generally. While claiming to be a true, Medicine not entitled to be considered as a complete or perfect Science.

## LECTURE VI.

### DETAILED CONSIDERATION OF THE INDUCTIVE METHOD.

*Observation.*—Observation defined. Common and Scientific observation contrasted. Circumstances favourable or the reverse to the acquirement of skill in observation. Origination of Medicine and other Sciences in observed facts. Subsequent undue neglect of these. Renewed attention to facts, in consequence of the writings of Bacon: followed by a reaction in the opposite direction. Alleged plethora of facts in certain departments of Medicine, and paucity of these in others. Extension of the field of Observation from the discovery and improvement of material aids to the senses. The acquisition of these not an unmixed gain in our own Science. Degree of perfection to which the Observing faculties may be brought by assiduous culture. Such culture the more demanded, the more the field of observation is extended, and the more numerous and complicated the instruments which we call to our aid. Facts and phenomena as they usually present themselves to the observer: Apparent unity and simplicity, but virtual complexity and diversity of these; calling thus for their decomposition or analysis, to render them available for the purposes of accurate Science. Observation a mental act; and apt, in consequence, to be mixed up with other mental actions. Difficulty of keeping Perception and Inference properly apart in this process. Admixtures of fancy and feeling with our observation of facts and phenomena. Effects of prejudice and preconceived opinion in giving a colour to our observations. The Imaginative Faculty, in its proper place, and under due subordination, useful in Observation. Its absence occasionally as hurtful as its excesses. Extent to which the decomposition of facts usually requires to be carried in practice. Ultimate analyses not always called for. Process of decomposition as usually attempted.

## LECTURE VII.

FACTS and phenomena as co-existent or successive. Observation of the order of succession of facts and phenomena. Singling out of Antecedents and Consequents from the mass of facts and phenomena as they present themselves in nature, and studying their relations in time. Baconian rule of varying the circumstances. Distinction betwixt "simple Observation" and Experiment, properly so called. Experiment to what extent different from and superior to, simple Observation. Earlier and later Experiments in the Medical Sciences. Experiment in the laxer and in the more strict sense of the term. Occasions in Medicine in which simple Observation is more applicable than Experiment. Experiment better adapted to the maturity than to the infancy of such a Science as ours. Inherent defect of simple Observation unsupported by Experimentation. Unhappy consequences of overlooking this illustrated. Combination of Observation and Experiment desirable, when attainable. Natural limits to the application of the Baconian rule in Medicine: The rule, notwithstanding, capable of wider extension than it has yet received: Illustrations from Therapeutics, and from Comparative Anatomy and Physiology: Partial results from its employment in Pathology and the Practice of Physic. The modification of the Baconian rule known as "the method of exclusion." Practical application, in Medicine, of this form of the rule. Due allowance not always made for the natural obstacles to the wider application of this rule to medical inquiries. Exaggerated notions of its value current both in and out of the Profession.

## LECTURE VIII.

*Simple Observation in Medicine.*—Extent of our reliance on it. Gaps in the succession of facts and phenomena remaining to be filled up by us. Circumstances in our position favouring the continuance of these gaps. With some exceptions, disease rarely encountered by the practitioner during its incu-

bation, or in its slighter and more evanescent forms. Many chronic diseases seen only by him during their periods of exacerbation. Favourable opportunities for the observation of the course of disease often lost from the caprice or distrust of the patient. The final result of disease, as encountered on inspection after death, usually different from the previous Pathological condition of the bodily organs. The admitted existence of diseases which leave no obvious traces of their previous existence in the dead body; and of extensive morbid changes, disclosed for the first time at the Post-mortem examination. Difficulty of connecting morbid processes with Therapeutical agencies, and of tracing the evolutions of Physiological changes. Obstacles to the completeness of our Observations, from the extent of the field over which they range. Varied characters of the influences at work in the body in health and in disease; and the lengthened periods over which such influences have frequently extended. Difficulty of perfecting a Natural History of disease. Instances of recent progress in this direction. Establishment of "The London Society of Observation," and of "The Pathological Societies" of Dublin, London, &c. Value of the Histological researches now extensively carried on. Closer, as well as more extended Observations, still needed in Medicine. Recent improvement in this respect. The Observer of the present day how far superior to his immediate predecessor, and how far still deficient in precision. Importance of following, not leading our observations. The latter the grand mistake of ancient Observers in Medicine. Modern tendencies in the same direction.

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## LECTURE IX. *harry*

*Experiment in the Medical Sciences.* Recapitulation of previous remarks. Superiority of Experiment over Observation simply, where the case admits of Experimentation. Our position in this respect, as contrasted with that of the cultivators of the so-called Experimental Sciences. No Science purely and exclusively experimental. Medicine more than a Science of pure Observation. Limits to experiment in Chemistry. Experiments in Pathology, Physiology, Materia Medica, and

Toxicology. How far our artificial processes are entitled to the appellation of experiments. Lax use of the term Experiment, both by the Profession and the public. Cautions alike applicable to the results of Simple Observation and of Experiment. Ground for these cautions, in regard to our Experimental trials especially. Illustration from Chemical Science. Conditions capable of modifying Experimental results, not to be safely overlooked. The danger of mingling the subjective with the objective elements in Experimentation. The complexity of phenomena, the main obstacle to the frequent employment and proper estimation of experiment in Medicine: Illustration from the History of discoveries in Physiology: The number of the experiments there called for: The varied forms required to be taken by them: The limited value of the results obtained: The number of points they have left unsettled. The worth of our Experimental trials impartially estimated. Superiority of these to simple Observation, as allowing us to detain, isolate, reproduce, and rearrange transient and complex phenomena.

While extending the means of research, they necessarily multiply our chances of mistake, afford occasions for rash conclusions, and tempt to the undue extension of their legitimate applications; circumstances sufficient to account for the contradictory results arrived at by rival Experimentalists. General insufficiency of single, or limited series' of experiments in the Medical Sciences. Exceptions to this general truth. Immediate results alone reached in these exceptional instances. Artificial generation of morbid processes in animals: Limited extent of such experiments: Difficulties in the way of their multiplication and extension: Inefficiency of the means hitherto employed for their production: The experimentalist sometimes, though not always to be blamed for their failure. Experiment, strictly so called, a resource unknown to the ancients. Defects of the earlier experiments. Experiments of Paracelsus and of the Iatro-mathematical School. Bacon's claim to the title of "The Father of Experimental Philosophy." Bacon himself not a successful experimentalist. Recentness of the introduction into Medicine of well planned and properly conducted experiments.

## LECTURE X.

*Methods of Experimental Inquiry.*—Limited value of Experiments undertaken at random, and conducted without method. Discoveries stumbled on in his way in the Arts and Sciences. The different procedure demanded by advancing Science. The so-called methods of agreement and of difference shadowed out by Bacon. Objects which these methods are respectively calculated to fulfil. “*Method of agreement*,” and its results, generally, in the Experimental Sciences. The extent of its applicability to the Medical Sciences. Successful results obtained by it in Physiology, and in certain departments of Pathology. Partial failures of this method in the discrimination of diseases; in the determination of their originating causes; and in enabling us to estimate the results of our curative agents and poisons, and their respective modes of action under different circumstances. Conditions of its successful application to medical questions. “*The method of difference*,” and its results generally. Examples of its application to medical questions. Conditions of its successful employment in the Medical Sciences. Errors traceable to the neglect of these conditions. The methods of agreement and of difference compared and contrasted. “*Joint method of agreement and of difference*.” “*The method of residues*.” “*The method of concomitant variations*.” The systematic employment, in medicine, of the modern methods of experimental research how far new, and deserving of being farther enforced. Our urgent need of more searching and better planned experiments. Inherent worthlessness of our Hospital returns. Defects of our Naval and Military reports. Fundamental errors of omission pervading these.

## LECTURE XI.

*Hypothesis.*—Hypothesis, what, and what it has in common with other forms of comparison. Abuse of Hypothesis prior to Bacon’s time, and consequent undue distrust of them. Their legitimate use again generally recognised. Natural bent of the uneducated mind towards Hypothesis. General

prevalence of these in ancient Medicine. Abuse of them in latter times. Loose Hypotheses under the garb of modern Science. True character of real Hypotheses. Important part played by them in the purer Sciences, in Medicine, and in common life. Hypothesis as a step towards Inductions from experimental truths. Undue tenacity of Hypotheses unverified and opposed to facts. Surprising vitality of Pseudo-theories and Pseudo-Sciences, having no better foundation than such Hypotheses. Modern instances within and without the Profession. Highest legitimate use of Hypothesis. Subordinate use of Hypothesis. Extended sway of probabilities in Medicine. Theories, correctly speaking, rarely attainable in our Science. Worthlessness of purely arbitrary Hypotheses. Instances of such Hypotheses from different periods of Medical History. Utility of rational conjectures based upon observed facts. Praiseworthy activity of modern practitioners in this direction, though too desultory in its character.

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## LECTURE XII.

Nov. 21<sup>st</sup> 1861

*Comparison Proper, or Analogy.*—Object in common in all the forms of the Comparative process. Sense in which the term comparison is used here. Analogy is one of the most direct forms of comparison. Hypothetical character of our Analogies. Analogies objected to on similar grounds with Hypotheses. Extended use of Analogies, in the looser sense of the term. Analogy, as a legitimate scientific process. Extensive employment of the Analogical method in various of the Sciences, especially in those coming closest to our own. Distrust of Analogy on the part of Bacon, and his followers in the Physical Sciences. Loose Analogies of our earlier Medical Writers. Analogy not to be dispensed with in any department of knowledge. Analogies frequently our sole available guide in practice. Readiness with which the experienced practitioner lays hold of them, where more rigid methods cannot be had recourse to. Their frequent failures in Medicine accounted for. Character of a sound Analogical argument, and the amount of dependence to be placed on it. Analogical reasoning falling short of a

complete Induction: Examples from Physics and Medicine. Analogical reasoning amounting to a complete Induction. When verified, such reasonings of the highest value, short of absolute proof. Subordinate uses of Analogies too imperfect to admit of complete verification. Conspicuous position always held by analogies in the Medical Sciences. Analogy betwixt the fertilization of plants and generation in animals. Homologies of the vertebrated skeleton: Aristotle and Newton's anticipations of modern views in this direction. Similar correspondence of separate parts in the Vegetable kindom. Homologous compounds in Chemistry. Analogy betwixt ordinary fermentation and certain metamorphoses of tissues and fluids in the animal body. Analogy between cell-development in the Vegetable and Animal kingdoms. Analogy between certain proximate principles in plants and animals respectively. Dubious Morphological Analogies. Dubious resemblances betwixt certain natural processes and diseases. Dubious resemblances assumed as the basis of our Classifications of diseases, drugs, and poisons.



## LECTURE XIII. *Nov 22<sup>nd</sup>/14*

*The Numerical Method.* The Numerical Element in several of the Sciences. Circumstances calling for the employment of Numbers in the Medical Sciences. Assistance which they are naturally fitted to render us. What they have yet to accomplish. Special adaptation of Vital statistics to public Hygiène, to Surgical and Obsterical enquiries, to Forensic Medicine, and to Materia Medica. Their limited applicability to Clinical researches, to purely Physiological phenomena, and to the departments of the profession bordering on the Social Sciences. Important place of the Science of Number in certain departments of knowledge. Drawbacks from its value even in the so-called Numerical Sciences. Modern Chemistry pre-eminently a Science of Quantity. Limited applicability of Enumeration to some of the Sciences: Exemplified in Physiology and the Social Sciences. Extreme views regarding Statistics in Medicine and certain of the nearly allied Sciences. Unphilosophical character of these views. The legitimate place of Statistics in Science generally. The points to be

embraced in the application of the Numerical Method. Large Numbers to be compared. Events or Cases to be of the same kind. Fortuitous occurrences to be eliminated. Number of so-called fortuitous occurrences in Medicine a fertile source of the failure of Statistics in our hands. Future remedy for this state of matters. Apparently fortuitous occurrences reducible to Empirical laws. Instances in point. Aggregates to be carefully distinguished from Extreme ratios. The value of aggregates to be estimated by the extent of our knowledge of the subject in hand. Mutual support yielded by averages by extreme ratios. Extreme values as the test of numerical theories. Concluding remarks.

## LECTURE XIV.

Nov 25<sup>th</sup> 1870

*Language, Terminology, Definition, Description.*—Language, as the embodiment of our ideas, and the instrument of our higher mental operations. Language an essential organ of education. Language as adapted for fixing thought, and serving for its diffusion. Language as the groundwork of all our Logical operations. Words, by turns, our servants and masters. Medicine fortunate in the language of its founders. Adaptation of the Greek tongue to the purposes of Scientific Nomenclature. Precision imparted to the vulgar tongues by the Schoolmen of the middle ages. The Modern Germans best entitled to dispense with the use of terms from the ancient languages. The fulness and appropriateness of our most advanced tongues not absolute, but relative. Advantage of the mastery of a plurality of languages. Philology is an important department of Ethnography: Light thrown by it on the early history of Medicine: Illustrations from Toxicology and Materia Medica. Abiding influence of the languages of ancient Medicine. Extensive prevalence of Greek and Latin terms in modern Medical writings: Barbarous appearance of some of these in their modern dress: The durable character of our earlier terms traceable, partly to the pliancy of their original languages, partly to the superiority of the ancients as correct observers. Comparatively slight traces of the modern languages in Medicine. Unhappy choice of Medical terms from our own

Language. Ancient Classical terms often unaffected by hostile criticism. Difficulty of engrafting new ideas on old names: Such adaptations nevertheless constantly called for. Principle regulating these changes. Motley appearance of our scientific language from the frequency of these adaptations. A purely Philosophical language unattainable. Signal failures of all attempts at the formation of such a language.

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## LECTURE XV.

RESEMBLANCE between objects grouped under common names: Illustration. Terms suggestive of false or inappropriate notions. Technical terms, and their leading characteristics. Equivocal character of many of our collective terms in Medicine. Negative character of many of our leading terms. Frequency of positive names in a negative form, and *vice versa*. Terms derived from long abandoned theories. Limits to the assimilative power of Classical words in Medicine. Etymological obscurity of many of our modern adaptations; especially in their vernacular forms. Arbitrary and Metaphorical characters of many of our terms. Terms in Medicine of uncertain derivation. Light thrown by Philology on the history of the profession.

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## LECTURE XVI.

THE defects of our Nomenclature a reflex of the short-comings of our Science. The improvement of the Science must precede the reform of its Nomenclature: Failures of the attempts of modern scholars in this direction. The retention of ancient Classical terms, how far advisable in Medicine: Advantage of such terms being accompanied with apt English Synonyms: The want of these obstructive of the popularity of Medicine, and injurious to the profession itself. The capabilities of our Saxon roots undervalued. How the admitted defects of our current Technical language may be best neutralized. Terms, in the general case, to be carefully defined, especially where new or obsolete words are had re-

course to. I The Definition should be made to embrace the essential attribute of the thing defined. II The Definition should be precisely adequate to express what is sought to be embodied in it. III The Definition should never be expressed in obscure, figurative, or ambiguous language. IV A Definition should never be negative when it can be positive. Definitions not indispensable to Science. Description as a substitute for definition. Faulty descriptions less excusable than faulty definitions. Description, on many occasions, our only resource, and the best safeguard against the perversion of our views. Wide scope of Description as compared with that of Definition. Requisites of fitting descriptions. Faulty descriptions in Medical Authors. Description, unless otherwise implied, to be limited to the results of the writer's own observation. The neglect of this limitation a characteristic feature in Medical writings. The success of Monographs by eminent writers traceable to the absence of this defect: Its prevalence in systematic works a reason for their being seldom perused. Certain early works deserving of being studied, from the closeness of their recorded personal observations. Necessity of many-sidedness in describing, and in following the descriptions of others. Oral communications, as distinguished from written descriptions. Superiority of Speech or Language when duly cultivated, over words addressed to the eye. Influence, legitimate or the reverse, which the Physician may acquire over his patients and the public, by attention to this circumstance. The means of usefulness thus afforded to the Medical Practitioner undervalued in the general case. Cautions called for in the adoption of symbols as substitutes for words or descriptions of facts and phenomena.

## LECTURE XVII.

### Classification.

Nov 28<sup>th</sup> 1861.

CLASSIFICATION, the basis of certain Sciences. Loose sense of the term Classification. The object of Scientific Classification. An extensive acquaintanceship with the subject—matter of Science a requisite for successful Classification. The first rude attempts at Classification in the Sciences gen-

erally. Character of the early Classifications in the Medical Sciences. Character of our existing Classifications. Slight recent improvements in these. Failure of our attempts at a Natural Classification. Inherent defects of any merely Natural system. Inelastic character of our existing Nosologies : obstructive of advance ; rendering our Symptomatologies unnaturally plethoric ; and necessitating the undue multiplication of Subspecies. Inadequacy of the existing Classification of diseases for the purposes of the Registrar-General. The arrangement of diseases adopted by him essentially an arbitrary one. Such an arrangement best adapted to the existing state of our Science ; and calculated to lead ultimately to a Natural one. Causes of the present divergence of our Natural and Artificial systems : explanatory of our failures in the attainment of a Physiological Classification of diseases. Obvious benefit of well-defined Species. Such species only fully encountered in some of the other Natural Sciences. "Typical forms" in Pathology : the only basis of a Natural Classification of diseases. Difficulty in practice of connecting the actual disease with its assumed type. Insufficiency of mere structural changes, or Physico-Chemical results for characterising diseases. Diathesis an insufficient basis for a systematic arrangement of diseases. Recent scheme for the natural grouping of diseases. Desiderata to be supplied prior to the establishment of a strictly Scientific arrangement of diseases.

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## LECTURE XVIII. *Nov 29<sup>th</sup> 1861*

*Induction limited.*

**THE INDUCTIVE METHOD.**—Induction, defined and limited. Legitimate range of its operations, and extent of its aims. Classes of mental operations not embraced by it. Inductions more than verbal transformations ; bare descriptions of observed phenomena ; or the pure results of experience. Objects aimed at in the scientific study of facts. The colligation of facts the basis of legitimate Inductions : This process not itself an Inductive operation. The so-called Inductions of the ancients mostly Empirical generalisations. True science dependant, at every stage, on such generalisations. Certain generalisations of this order admissible without

formal proof. Rules for testing the validity of our generalisations, whether Empirical or Scientific. The Proposition itself must be a truth: Difficulty of determining the truth of facts, general or special: Fictitious principles in Medicine, and in the other Sciences. The proposition must be the expression of a universal truth. Error of deducing general statements from limited numbers of facts. Examples of hasty generalisation in Medical Science: Error of stretching facts or principles too far: Illustrations from our own Science. Natural tendency of the mind towards untested Inductions: especially observable in such a Science as ours. Limited character of our Inductions. How far limited generalisations available: Danger of undue reliance on them.

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## LECTURE XIX.

Decr 2<sup>nd</sup> 1861

PROGNOSIS or prediction, as the highest aim of the Inductive method. To what extent the search for causes an Inductive; how far a Deductive operation; and how far requiring the union of Induction and Deduction. Chaotic appearance of phenomena as first encountered in nature: Their orderly character only observable on a closer study. "Prerogative instances" of Bacon: How far fitted to guide us in our Inductions: Their value, in this respect, more apparent than real: Errors, in medical Science, originating in undue reliance on instances of this sort. Phenomena best fitted to conduct us towards valid Inductions. Limited number of these in the Medical and other Sciences. The discovery of them often accidental. Illustrations from different departments of Medicine. The basis afforded by them too narrow to support any extended Inductions.

*General Results of the application of the Inductive Method to Medical Science.*—Medicine, as it presents itself respectively to the Scientific practitioner, to the Empiric, and to the Professional amateur. Medicine presents no mysteries or depths to the superficial observer. Undue confidence in his own acquirements on the part of the mere routine practitioner. Our deficiencies only come out with our advances in Scientific acquirement. Real character of the problems for solution in medicine. Circumstances under which these

have to be dealt with. Limits reached by us in simple Observation, Experiment, Analogy, and Numeration. The penetralia of the Sciences not yet arrived at. Restricted range of our Prognoses, Etiology, and Therapeutics. Physiological and Pathological anomalies: Illogical inferences from these. Inutility of isolated enquiries in Medicine. Futility of the search for exclusive or infallible remedies for diseases. Folly of any restricted range of curative measures. Influence of varying circumstances over the results of disease: explanatory of apparently fortuitous events, and unusual effects of treatment. True light in which to regard these anomalies. Varying types of Epidemic and other diseases. Nature of the principles hitherto established in Medicine. Regard to be placed on the results of individual experience, as embodied in Empirical formulæ, and approximative generalisations.

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## LECTURE XX. *Decr 3. 1861*

THE DEDUCTIVE, OR SYNTHETIC METHOD.—The Deductive, contrasted with the Inductive method. Order of procedure in these methods respectively. The Deductive method in Mathematics; and in the Sciences of Chemistry, Anatomy, and Histology. Desirableness of its further extension to other branches of Medical Science. Causes of its former failures in Medicine. Promise of higher results from it in our hands. Amount of recent acquirement in this direction. Deduction in the hands of the Neurologist, the Comparative Anatomist, the Organic Chemist, the Physiologist, and the Pathologist. Generalisations of the modern Chemical school examined; and their value impartially estimated. Other late generalisations in Physiology and Pathology reviewed. How far the Deductive method likely to predominate in future in the Medical, as in the other Sciences. Deduction as now proposed for practice, properly speaking the Joint Method of Induction and Deduction. Deduction, as practised prior to Bacon's time: faulty in its neglect of previous Inductions, and of the study of nature. Extent of the prevalence of Induction in modern medicine. Obstacles to the adoption of Deduction in the Medical Sciences. The union of Analysis and Synthesis essential to a complete Deduction. Laws of

highest generality only thus attainable. The hesitation and uncertainty of our Science traceable to the want of such laws. Detailed illustration. Explanatory remarks.

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## LECTURE XXI.

Decr 4<sup>th</sup> 1831

### THE JOINT METHOD OF INDUCTION AND DEDUCTION.

Preliminary Explanation.—*The separate steps or stages of the Joint method. Analysis, or Induction proper.* Problem of the Joint method stated. Cases in which the laws of Causes are reached with comparative facility. Cases of an opposite sort. Difficulty of dealing with the complex laws of Vital phenomena: most conspicuous in Physiological investigations: especially in Medical Psychology. Obstacles to the appreciation of the effects of our Therapeutical agents. Assistance sometimes afforded by Pathological facts, in guiding us to the Laws of effects: How these admit of being successfully studied, when naturally arising, or when produced artificially. Limits to our Inductive resources for ascertaining the Laws of Causes: The results of Observation rarely to be explained or predicted: The Empirical laws of phenomena fortunately of easier attainment: Difficulties attaching even to these, not only in Medicine, but also, though to a less extent, in the purely Deductive and Experimental Sciences. *Synthesis, or Deduction proper*; a pure process of ratiocination. Sciences in which Deductions attain the highest value, and the greatest degree of accuracy. Sciences in which we necessarily come short of all this. Alleged failures of our Deductions in Medicine; to what extent to be admitted; and how far similar failures are witnessed in other Sciences. *The Verification*, or testing of our separate *Deductions*. Worthlessness of untested Deductions. Experience the test of the worth of these; a truth distinctly insisted on by Bacon; and only fully realised and acted on in later times

## LECTURE XXII.

RESULTS OF THE JOINT METHOD OF INDUCTION AND DEDUCTION.—The entirety of the true Philosophical method not to be safely lost sight of. The final aims of Science, the discovery of causes, and the generalisation of facts. Cause defined and explained. The respective parts played by Analysis and Synthesis in the search after Causes in Science generally, and in the generalisations which it seeks to arrive at.

*Discovery of Causes.*—Twofold aspect in which the multi-form phenomena of nature may be regarded: Phenomena seemingly synchronous or co-existent, and phenomena whose successions can be traced. Instances of co-existent phenomena. Instances of phenomena now synchronous, now successive. Invariable order amongst the mass of successive phenomena. The Antecedent amongst such phenomena regarded as the Cause of the effect, and the Consequent as the effect of the Cause. Universality of the so termed law of Causation. Necessity of assuming that the Antecedent has preceded the Consequent, even where the former has not been perceived. Absurdity of the use of language implying the reverse of this. What is implied by the efficiency and the invariability of the Causes of events. Sequency rarely traceable betwixt a single Antecedent and the Consequent. The Consequent usually seen to be the sum of several Antecedents. Tendency shown in Medicine to connect effects with single Causes: Illustrations from various departments of the Science. Arbitrary distinction betwixt Causes and Conditions in Medicine. The immediacy or directness of the Antecedent no sure test of the closeness of the connection of the Antecedent with the Consequent. Comparative facility of connecting certain groups of Antecedents with some particular Consequent. Increasing difficulties arising where the Antecedents diminish in number. Instances of apparently single Antecedents capable of being resolved into parts of a chain of Antecedents; as in the cases of certain poisons, or the apparent causes of some sudden deaths. The connection of the so-termed “immediate Cause” with the event, occasionally seen to be of a purely casual or uninfluential sort; and the real Antecedents, such as can only be reached by tracing back the history of the case, and taking all the Conditions into account. Unphilosophical character

of the notions frequently attached to the terms "Predisposing and Exciting causes," in Medical writings. Illustration. The distinctions betwixt remote and proximate, and between predisposing and exciting Causes, not absolute but relative. Circumstances tending to give undue prominence to particular Antecedents. Difficulty of correctly estimating the relative importance of the various Antecedents in the chain of Causation.

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## LECTURE XXXIII.

THE more obtrusive phenomena, those which have attracted our particular notice, or those which we have been the first to discover, often arbitrarily singled out as the Causes of disease. Rarity of instances even seemingly justifying such selections. Priority of appearance the best claim to a distinction of this sort, were any precedence amongst Antecedents generally admissible. Concurrence of the different Antecedents essential in every case to the event. Mutuality of cause and effect. The order of the succession of phenomena not always essential to be settled in our Analyses and Syntheses. Influence of negative Conditions in counteracting the effects of the Causes of events. Distinction between the mere regular Succession and the Causal connections of Antecedents and Consequents. Illusory character of the ordinary distinction between "agent and patient," and the injurious consequences to which its adoption may lead in practice.

## LECTURE XXXIV.

*Composition of Causes.*—This principle admitted by the Schoolmen, and taken into account by Historians, Metaphysicians, and writers on the Social Science. Apparent general prevalence in Medicine and other Sciences of the opposite principle of "the interference of Causes," as exemplified in Chemistry, Toxicology, Materia Medica, Physiology, and Pathology. Reasons for believing these instances to be but special and exceptional cases. Instances of the Com-

position of Causes not unknown in Chemistry; recently pointed out in Toxicology; readily discernible in Pathology; and numerous in Therapeutics. Instances, in Medicine of the seemingly mutual balance, and of the alternating prevalence of the two principles of the Interference and the Composition of Causes. Distinction between Causal phenomena instantaneous in their action, and those capable of acting permanently. Examples of momentary effects from temporary Causes. Examples of permanent effects from temporary Causes.

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## LECTURE XXV.

GENERAL prevalence of progressive effects from the continued action of Causes. Such effects rarely obtainable by art, from the difficulty of long maintaining Causes in action. Cumulative influence of the continued action of Causes and their progressive effects combined. Illustrations from different departments of Medical Science.

*Generalisations in Science.*—The desire of unity not only a prominent characteristic of the human mind, in harmony with the teachings of experience, and an effective mean of discovery in Science, but also an abundant source of error, as shown by the speculations to which it has given rise at various periods in our own and other Sciences. Detailed illustrations. Distinction between the lower and the higher scientific generalisations, and the relative values of these respectively. Medicine not a Demonstrative Science. Extent of the Generalisations hitherto reached by us. Provisional character of these. Their utility, as adapted for immediate use, as the best foundation on which to rear true theories, and as our only available resource in the absence of these.

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## LECTURE XXVI.

WITHIN certain limits, our generalisations, though incomplete, equal to demonstrated truths in value and certainty.

Subordinate character of the conclusions arrived at in the Physiological, Moral, Social, and Political Sciences, as compared with those established in the more advanced of the Physical Sciences. A like elevation presumably attainable in the Science of Man generally, as in the Physical Sciences, by following the same path of advance. Departments of our own Science in which satisfactory progress has already been made. Departments of it in which our deficiencies are most conspicuous. How far these deficiencies are traceable to the neglect of the improved methods of modern Science, and to what extent we may overcome them by the systematic adoption of better methods. Sources from whence the positions recently attained by us, in Medicine, have been derived: traceable mainly to improvements in the auxiliary Sciences. Late advances in Descriptive Anatomy, Histology, Experimental Physiology, Organic Chemistry, and Comparative Anatomy. Actual gains to practical Medicine from these varied sources. Farther advances which may yet be reasonably expected from these quarters. Facilities now offered for the reduction of phenomena and processes formerly only admitting of being studied in their aggregates. Use which may be made of such single instances as are to be occasionally encountered in Medicine: Illustrations from various departments of the Science. Recourse which may be had to the process of breaking up complex, in the failure of simple instances. This process exemplified in the establishment of the Compound radicles of Organic Chemistry. The application of the process in Medicine. Arbitrary character and little value of most of our groups. Examples of the faulty grouping of diseases, and of the sort of arguments on which their defence is rested. Proposed substitution of Natural, in place of arbitrary groups. Claims of the so-called Diatheses of modern Pathologists to this distinction examined. Concluding cautions.

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## LECTURE XXVII. *Dec.*

**FALLACIES.**—*A priori fallacies.* Preliminary remarks. The more restricted meaning of the term fallacy, as employed by

the pure Logician. Wider sense of the term in applied Logic, as inclusive of the errors of Observation, Comparison, Generalisation, and Ratiocination. Defence of this extended view of the subject. Limits of the Syllogism, as a test of truth. Direct and indirect forms of errors. The history of human error a subject of vast extent. Error as the mere negation of truth: Amount of its prevalence in this form. Various obstacles to the establishment of truth:—Indolence; Indifference; Mental prepossessions; Half-reasonings. Casual, or accidental fallacies to which these may lead, and the insecurity of their foundations.



## LECTURE XXVIII.

AXIOMATIC truths, or self-evidencing Propositions. Extreme views held in respect to these. Extent of the sway of Pseudo-propositions, especially in former times. Sources of such mistakes:—Superstition; Credulity; the prevalence of unsound or false theories; undue deference to Authority; Ignorance, or imperfect knowledge. Supports on which *à priori* fallacies are now mainly made to rest. Mistaking the comprehensible for the true; and *vice versa*: The former error the stronghold of charlatancy amongst the uneducated, and amongst minds of limited range in the educated classes: The latter error obstructive of beneficial changes in opinion and practice in our own and other Sciences. Mistake of ascribing objective existence to pure abstractions. Earlier and later tendencies towards the Spiritualising of natural operations: Medical Realism; popular with non-professional persons: Effect of it on our current language: Its injurious effects on the Science. Prejudice in favour of a single Cause for every effect: Unity of plan, and universal adaptation of means to ends in nature: Consistent with the belief of a sequence of secondary causes: Mistakes of Bacon and his followers on this point: Futility of the search for efficient causes: Teleology in Medicine, and the Natural Sciences generally. Unity of plan also consistent with and involving a variety of means towards ends; as shown in the genesis of disease generally. Difficulty of going back to the starting point of any phenomenon: a circumstance which accounts for the barrenness

of the Baconian Logic, as propounded by its author. Bacon's fundamental error without the support of experience: Prevalent in Philosophy, Science, and common life: Its commanding sway in Medicine at various periods; Earlier instances: Later instances: Cases adduced in its favour: The protective power of Vaccination: Specifics for disease. Such exceptions more apparent than real. General failure of single agents in Medicine. Prejudice of the resemblance between the conditions and the results of phenomena. Parallel instances of this fallacy in ancient and modern times. Fallacy of confounding effects with *veræ causæ*. Injurious effects of this error on the character of the profession, in the estimation of men of Science generally.

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## LECTURE XXIX.

Decr 16/16

*Fallacies of observation.*—Such fallacies negative or positive. *Negative Fallacies.* Non-observation of instances: Extent of the prevalence of fallacies of this sort in Pseudo-Medicine: Their bearings on the position of the regular practitioner: Their existence in quarters little suspected: Unscientific character of much of our Sanitary literature. Non-observation, due to pre-conceived opinion: Extensive prevalence of fallacies hence originating: Their usual mode of operation: Their frequency in Medicine: Illustrations. Non-observation of circumstances: Illustrations from Chemical Science: Illustrations from earlier and later Medicine: Occasionally traceable to self-deception or imposture: Recent instances: Sometimes originating in superstition: Occasionally in wilful ignorance or design: Instances in point: Occasionally owing to inexperience: Such errors not harmless. Common source of the various negative fallacies. *Positive fallacies.* “Mal-observation.” Originating causes of fallacies of this class: Defective mental training: Erroneous impressions on the senses: Neglect of the verification of these impressions: Neglect of the due education of the senses: Inattention to what is before the observer: Deceptions of the senses: Hallucinations of the insane: Defect of analytic power: Direct bearing of this on medical observation.

## LECTURE XXX.

Decr 17/16

*Fallacies of Generalisation.*—Error of overestimating the extent of our generalisations. Error of resting general conclusions on a purely analogical basis. Special temptations to this form of fallacy. Generalisations built on loose or inappropriate Numerical statements. Generalisations rising out of faulty Classifications, in different departments of medicine. Errors originating in wrong conceptions of the Inductive process itself. Error of unduly restricting possible results: Limitation of our insight into the operations of Nature: Unexpected character of some recent discoveries in Science: Conditions of disease, and of health, but partially known: The admission of occasional variations in these called for: Disappearance of diseases formerly prevalent: Appearance of new diseases: Premature removal of restrictions to the spread of disease. Fallacy of combining various causes into one: Examples in Physics, Metaphysics, and Physiology: Futility of such attempts: Their unscientific character. Fallacy of "post hoc ergo propter hoc" conclusions: Exemplified in the grosser forms of Quackery: This fallacy to be guarded against by the young Practitioner: Various errors into which it may lead: Ancient and modern illustrative instances. Errors of resting general conclusions on partial and exceptional facts and occurrences.

## LECTURE XXXI.

*Fallacies of Ratiocination.*—Use of the Syllogism in the detection of such fallacies. Facility of detecting them in ordinary chains of reasoning. Distinction betwixt Ratiocination and mere disputation: Temptations to indulge in this in the discussion of Medical questions: Injurious effects of the frequency of errors of this class on the character of the profession: Illustrations. Fallacy of "Incomplete enumeration." Various fallacies in the "Conversion of Propositions." Forms assumed by these in the hands of several parties: Fundamental error in each instance. The support yielded by such

fallacies to Pseudo-theories at various periods in Medical history. Fallacy of confounding the contrary with the contradictory of a proposition: Instanced in medicine. Fallacy of assuming a Proposition, and supporting it by illustrations, in lieu of proofs: Various forms of this fallacy in authors: Readiest means for its detection: Practical illustration from Legal Medicine. Fallacy of changing the premises in an argument. Fallacies from the misapplication of abstract truths: Temptations to these in Medicine, and in some of the other Sciences. Fallacies from Ambiguity in the use of terms: Instances in Medicine: Injurious consequences of these.

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## LECTURE XXXII. *See v. 19. 16*

PUTTING an Extreme Case. Error of confounding sameness and similarity: General amongst non-medical and inexperienced persons where our own Science is concerned. Errors arising from confusion of language. Error of forgetting that though the individual arguments may not authorise a conclusion, the collective ones may do so: The converse of this not necessarily true. Fallacy of "begging the question:" "Reasoning in a circle:" Ancient and modern instances in medicine. Fallacy of "irrelevant conclusion:" Various illustrations.

*Fallacies of Testimony.*--Character a proper object of all testimony. The several distinctions betwixt immediate and mediate testimony, direct and circumstantial, and personal and real evidence, not to be safely lost sight of. Tests of the truth and value of evidence. Fallacies originating in defective or incomplete testimony: Essentially negative character of these. Refutation of the statement, that false facts abound in Medicine. Fallacies originating in inconsistent or contradictory testimony. Positive character of errors of this class: Exaggerated notions as to their frequency in Medical writings, and on occasions of judicial trials, in the case of the Medical witness.





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